only viable option to secure the native Yellowstone cutthroat trout population, and provide them with sufficient habitat to ensure the population's long-term survival.

Piscicide application occurred in 2008, and subsequent monitoring found this effort was successful in removal of nonnative brown trout. Remaining conservation actions for Crooked Creek will include monitoring to document downstream movement of Yellowstone cutthroat trout into the reclaimed stream, and evaluation of the efficacy of the barrier in preventing reinvasion of nonnative fishes. In addition, genetic monitoring is a potential activity that will determine if low population size and inbreeding depression present threats to Crooked Creek's native Yellowstone cutthroat trout population.

6.10 Shoshone River Subbasin (HUC 10080014)

The Shoshone River HUC (Figure 6-44) lies mostly in Wyoming, with a small portion extending north into Montana. Historically, Yellowstone cutthroat trout occurred throughout the Shoshone River main stem and many of its tributaries. Until recently, Yellowstone cutthroat trout were restricted to a short expanse of Piney Creek, a small spring creek on the west side of the Pryor Mountains in Montana. In 2010, a conservation effort to restore Yellowstone cutthroat trout into the creek resulted in release of Yellowstone cutthroat trout into the creek following an initial piscicide project aimed at removing nonnative brook trout and rainbow trout.

The Sage Creek watershed encompasses the majority of the Montana portion of the Shoshone HUC (Figure 6-44). Streams in the Sage Creek watershed originate in the Pryor Mountains, and landownership includes CNF, the Crow Reservation, and BLM lands. The valley portions of the Sage Creek watershed flow through arid scrubland. Currently, the suitable potential habitats for Yellowstone cutthroat trout are restricted to headwaters portion of the basin within the Pryor Mountains.

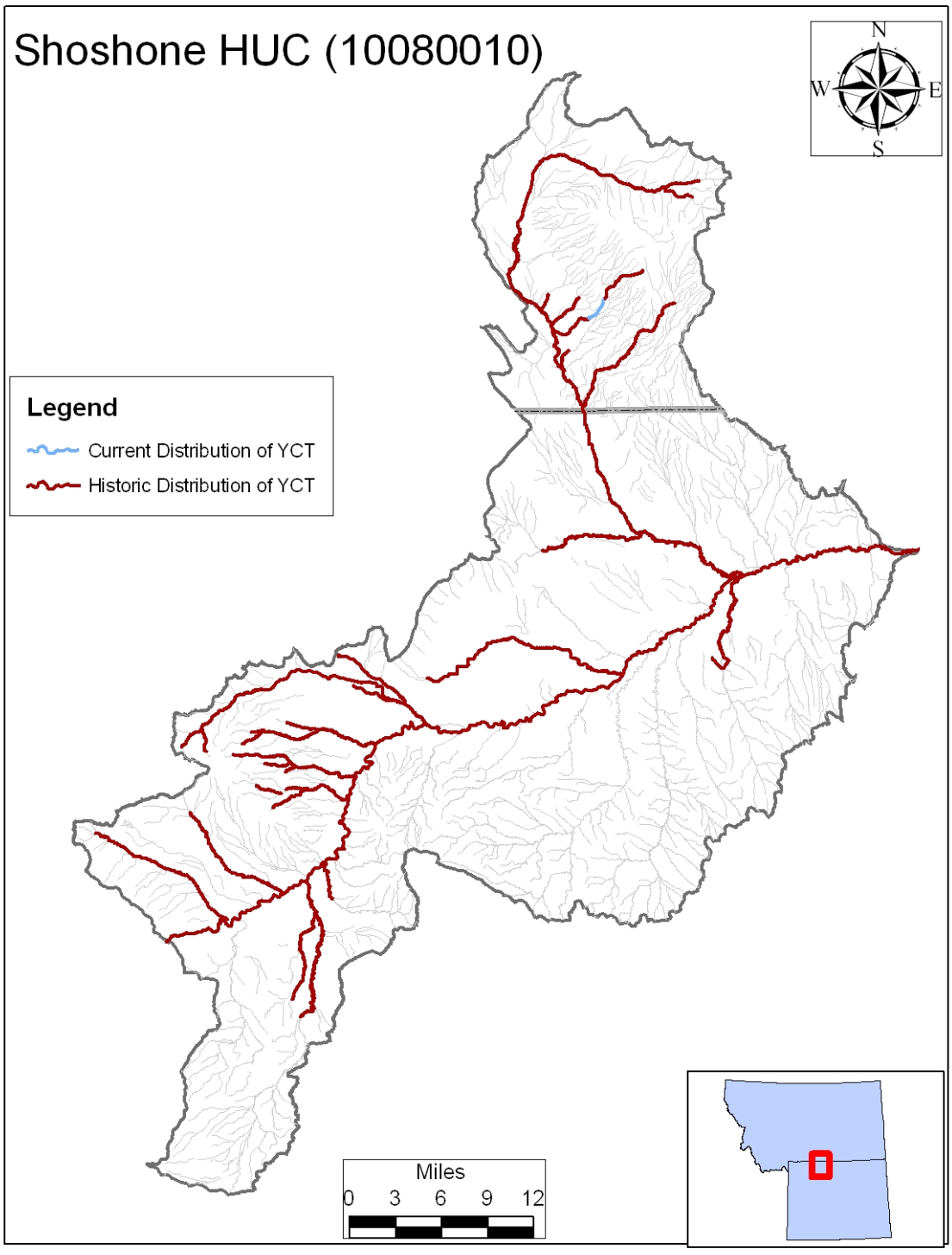

Figure 6-44: Shoshone River Subbasin (HUC 10080014)

6.10.1 Sage Creek

Sage Creek (Figure 6-45) originates in the northern terminus of the Pryor Mountain and flows west then south to the Wyoming border. Sage Creek and its tributaries flow through a mixture of national forest and private lands before entering the Crow Reservation. Habitat suitable for cold-water fisheries extends from its headwaters to Bowler Flats, an area of irrigated crop production located about 3 river miles downstream of the Crow Reservation boundary. Downstream of Bowlers Flats, Sage Creek is largely intermittent and provides habitat more suitable for warm-water, prairie fish species.

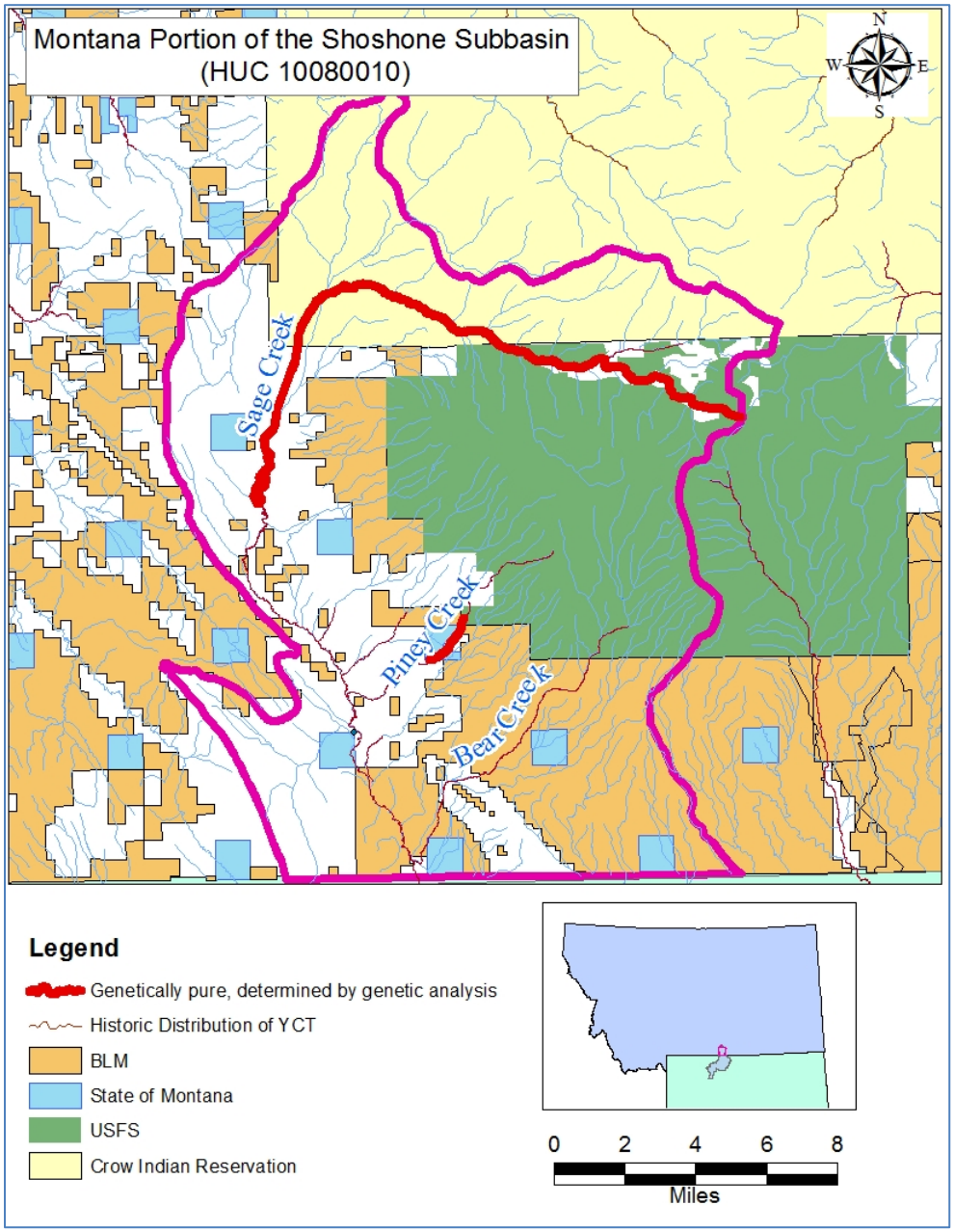

Figure 6-45: Montana portion of the Shoshone Subbasin.

Sage Creek has been the subject of current and ongoing actions to reestablish a population of Yellowstone cutthroat trout. Introductions of rainbow trout and brook trout in previous decades resulted in extirpation of the stream's native Yellowstone cutthroat trout population. In late summer of 2010, state and federal agencies, and the Crow Tribe, initiated a piscicide project to remove the existing fishery. Piscicide treatment began in the headwaters and extended through the Crow Reservation and several miles downstream into privately owned valley portions of the stream. As Sage Creek is typically dry downstream of irrigated pastures outside of the Crow Reservation, no barrier was required to prevent reinvasion of nonnatives from the Shoshone River in Wyoming.

Ideally, the first piscicide treatment results in a total fish kill; however, complex habitat can result in refugia for target organisms. Monitoring in 2011 found several brook trout, resulting in re-treatment of a portion of Sage Creek. Follow-up monitoring in 2012 yielded no brook trout, indicating the second treatment was sufficient in eradicating nonnative fishes. Monitoring will continue to ensure complete reclamation. As Sage Creek supported a popular recreational fishery for visitors to the CNF and locals, an interim reintroduction of Yellowstone cutthroat trout occurred soon after the first piscicide treatment. The objective was to provide anglers with catchable trout in an effort to mitigate the effects of piscicide treatment on recreation.

The Sage Creek Yellowstone cutthroat trout restoration project has substantial conservation benefit. Notably, Sage Creek will provide over 25 miles of stream habitat for native Yellowstone cutthroat trout that is also free of nonnative trout species. This extent of protected habitat is exceedingly rare throughout the Yellowstone cutthroat trout's historic range and is unprecedented along the fringe of the remaining distribution. Moreover, reestablishment of Yellowstone cutthroat trout into this amount of connected habitat in a watershed where they have been nearly extirpated is a substantial reversal of historic loss.

Additional conservation actions for Sage Creek relate to improving habitat quality in portions of this reestablished range. In some reaches, livestock grazing practices are incompatible with riparian health and function, and in-stream habitat quality. Implementing BMPs that maintain agricultural values while improving stream health would be beneficial to Sage Creek's restored Yellowstone cutthroat trout population.

6.10.2 Piney Creek

Piney Creek (Figure 6-45) emerges as a small spring creek in the foothills of the Pryor Mountains. Piney Creek supports the sole remnant population of Yellowstone cutthroat trout in the Shoshone HUC, and the fish-bearing portions of Piney Creek are restricted to less than a mile of channel. The stream flows through CNF, BLM lands, and state lands before entering private lands.

This small population of Yellowstone cutthroat trout faces several threats, including small population size, isolation, entrainment into irrigation systems, and limitations in habitat quality.

Soon after entering private lands, an irrigation system intercepts Piney Creek's flows, and water occupies its historic channel only during spring run-off or storm events. The irrigation system presents a sink for Yellowstone cutthroat trout in Piney Creek, as fish entering the canals are lost. Livestock use of the riparian area has potential to reduce habitat quality and trample redds in the small amount of available spawning habitat. Pool habitat and areas with spawning gravels are also limited, which affects carrying capacity and recruitment of Yellowstone cutthroat trout.

Several actions have contributed to conservation of Piney Creek's Yellowstone cutthroat trout population. In 2010, modification of the downstream diversions established a means to continue delivery of water to water rights holders, while impeding entrainment of Yellowstone cutthroat trout. This project involved impounding the lower end of the fish-bearing portion of Piney Creek into an existing depression. Instead of culverts set at grade, installation of three screened standpipes allowed for delivery of water to irrigation ditches and the historic channel. The pond provides low-water refugia for Yellowstone cutthroat trout, and the standpipes discourage entrainment of juvenile and adult Yellowstone cutthroat trout. Young fish will be unlikely to venture into the water column and will not encounter the standpipes. The screens will prevent older fish from being entrained.

Habitat improvements have also been a part of conservation actions in Piney Creek. Riparian fencing and off-channel stock tanks now reduce the pressure exerted by livestock on the stream. Installation of rock and log structure promote scour of pools and allow for sorting of gravels to improve the availability and quality of spawning habitat.

Small population size and isolation continue as substantial risks to Piney Creek's Yellowstone cutthroat trout population. FWP will monitor the population and its genetic status. Reintroduction may be necessary in the event disturbance eliminates this small population. Likewise, supplementing the population may be warranted if inbreeding depression results in genetic risks.

6.10.3 Bear Creek

Bear Creek (Figure 6-45) is a tributary of Sage Creek that likely supported Yellowstone cutthroat trout historically. Its headwaters originate in the Pryor Mountains, and it flows through CNF lands, BLM lands, and private lands until its confluence with Sage Creek. No fisheries data are available for Bear Creek. Future efforts should include fish surveys and determination of Bear Creek's potential to support reintroduction of Yellowstone cutthroat trout.

6.11 Lower Bighorn Subbasin (HUC 10080015)

The lower Bighorn River hydrologic (Figure 6-46) unit begins at Yellowtail Dam, and encompasses the area contributing to the Bighorn River until its confluence with the Yellowstone River. The upstream portions of the watershed are within the Crow Reservation, and the downstream two thirds of the basin are on primarily private lands. Land uses include livestock grazing and irrigated crop production.